APPENDIX B

VERSION WITH MARKINGS TO SHOW CHANGES MADE
37 C.F.R. § 1.121(b)(iii) AND (c)(ii)

SPECIFICATION:

Paragraph at page 1, line 4 to page 1, line 8:

BACKGROUND OF THE INVENTION

The present invention has an aim of providing a device for scanning register marks into a polychrome printing machine processing a sheet or a web material. This material, or print substrate, usually has an area for printing the image and a printing area for the accuracy control marks, marks usually known under the name of register marks, related to the setting into register of the different printing colors.

Paragraph at page 1, line 20 to page 1, line 25:

Many known devices, such as those described in documents CH690096, EP0401691 and US5747795, allow to register and scan these marks printed on sheet or web elements traveling [travelling] in front of a light source. However these devices can usually scan only one register mark at the same time, which means that a polychrome print i.e. requires as many scanning devices as [than] there are marks, that is to say colors into the print.

Paragraphs at page 1, line 34 to page 2, line 18:

Other devices, such as the one described in document EP0512448, propose to solve problems of selecting register marks which have the characteristic to be slightly contrasted with regard to the background color of the substrate on which they are printed; usually when the printed colors fade to paleness such as [it] is the case for example with pastel yellow, cream or light blue. The above mentioned device allows to scan only one mark at a time, the latter being illuminated [enlightened] by a white colored light source. The light reflected by this mark is separated by two channels made of optical fibers [fibres] at the end of which two filters of different colors are arranged and located in front of two photosensitive units. Each photosensitive unit is especially sensitive within a frequency range of a distinct color and produces an electric signal at the time of the register mark traveling [travelling]. The mark

scanning is achieved by means of a comparting/selecting [comparating/selecting] device which selects [selecting], among the generated electric pulses, the more representative one for the color mark.

When the aim is the simultaneous scanning of several register marks by means of the same device, the lighting of these marks becomes an increasingly significant component, particularly when a single, white or monochromic light source cannot make these marks more visible [anymore]. Indeed, according to the color of the printed marks, the latter seem likely, under such a lighting, not to be sufficiently contrasted and to appear as invisible or, on [at] the contrary, to generate dazzling or reflecting problems in the presence of specular colors such as gold color marks for example.

Paragraphs at page 2, line 24 to page 2, line 37:

Hence, in a whole third of cases, the printed colors are not so distinguishable [honest the ones] from each other [others] and require specific lightings in order to improve the real contrast either between themselves or in accordance with the background color of the printed pattern. Thus, a mark with a prevalence of green, purple or orange will appear all the more contrasted when [than] its lighting color is full of complementary color, that it to say respectively in red, yellow or blue for the case.

In order to guarantee the reliability and the performance of the scanning systems, it is also obvious to make these distinctive marks quite apparent. Indeed, at the time of the start up of the printing machine, the first stage comprises the searching of the initially unknown positions for each register mark. This process is easier when each of the [said] marks is illuminated [enlightened] by a source of appropriate color. In the same way, when these marks travel at significant speeds, i.e. up to 20 m/s, one will easily note that it is also obvious, even necessary, that these marks can be scanned without any possible doubt.

Paragraphs at page 3, line 8 to page 3, line 21:

SUMMARY OF THE INVENTION

The aim of the present invention is to overcome these disadvantages while offering a compact scanning device which allows, with a minimum of one scanning head, the

simultaneous scanning of several register marks. Generally, several marks each [whereas the latter generally] require [each one] a scanning device equipped with a special lighting so as to present a sufficient contrast needed for their scanning. The device according to the invention is advantageously able to scan some shifts between each color prints after simultaneous scanning of a reference mark and of one or more register marks by only scanning head.

This aim is reached thanks to a scanning head equipped with one or more lines of photosensitive elements, generally identical, and light issued from a light source for [of] which one might alternatively modify [modifies] the color and/or the intensity. The use of a plurality of different elements sensitive to particular colors related to the ones used into the printing, has a same action and can be considered as being another embodiment of the [said] device.

Paragraphs at page 3, line 29 to page 4, line 5:

The simultaneous or nearly simultaneous scanning of these marks by this device depends neither on these marks' shapes, nor [marks shape, neither] on their size, nor on their layout [the ones] related to the others. Thus, the scanning of concentric and slightly contrasted register marks can be simultaneously scanned without any problem with [by] the device of the invention, which will alternatively modulate its lighting color according to scanned marks in order to make them alternatively quite visible.

Appropriately, it is possible, for the already known shape of the marks to scan, to vary the alternation lighting periodicity in time or to vary the extension of the areas enlightened one by one. Hence, it could be useful to determine and set various lighting sequences being specifically convenient to the geometry of a certain kind of selected marks. Acting as an example, a continuation of such sequences could comprise the scanning of a group of several successive lines illuminated [enlightened] under a same color, then the scanning of a succession of lines alternatively projected one by one, in one color then in another, before getting back to the scanning of a group of several lines under the same lighting.

Paragraphs at page 4, line 16 to page 5, line 27:

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood by studying a mode of realization selected as a by no means restrictive example an illustrated by the attached figures, in which:

- Fig. 1 is a schematic perspective [prospective] view of said scanning device laid out upon a substrate printed with register marks,

- Fig. 2 is a strongly increased view of an example of a pair of register marks printed on a substrate by a polychrome machine,

- Fig. 3 is a strongly increased view of an example of a pair of concentric register marks as printed on a substrate by a polychrome machine.

- Fig. 4 and 5, are views of register marks of respective figures 2 and 3 as appearing under lighting areas, in two different illustrative scanning modes, during their simultaneous scanning by the device of the invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

Fig. 1 is a schematic perspective [prospective] view of device 1 of the invention. This device is arranged upon a substrate 2, traveling [travelling] into a polychrome printing machine, so that it can easily scan the register marks 21, 22 printed on this substrate. The scanning device 1 comprises a box, line-dotted and partially represented, in which there are at least two light sources 3, 4, which allow both sources to project alternatively on the substrate 2 a lighting area 5 overlapping at least the area involved with the register marks 21, 22. Each source of light 3, 4 is usually composed of [by] one or more light-emitting diodes 13, 14 such as the ones illustrated as an example in [on] Fig. 1. The scanning device 1 also includes an optical device 6 allowing to project, on at least one photosensitive element 7, the image of a portion 8 of the substrate surface 2 which is illuminated [enlightened] in the area 5. Scanning portion 8 corresponds to an area the size of which is mainly selected to be related to the size of the register marks and to the contents of the operations plan of the scanning device. The [; the] latter defines in particular the image resolution of the aforesaid scanned register marks, as well as the run speed of these images by the scanning device according to the travel speed of substrate 2. The photosensitive element 7 can be a CCD sensor made up of a great number [amount] of pixels 17

generating electric pulses and forming, according to their amount and their location, one or more photosensitive areas located side by side. In [On] Fig. 1, only one area of pixels 17 constitutes the photosensitive element 7 as illustrated. The latter is connected, like the scanning sources 3 and 4, to a microprocessor 9 which allows in particular to control the lighting of these sources according to a registered mode and to deal with the pulses generated by each pixel 17.

The operating way of this device is intended to scan the register marks 21, 22 in their entirety [integrality] by successively registering adjacent images portions 8, alternatively illuminated [enlightened] in one color and in another one, thanks to the light sources 3, 4. Each portion 8 of register marks is preferably scanned only once under the light of one of the light sources, the latter having lighting sequences controlled in time and duration according to the selected more into the microprocessor 9. The final image of the register marks obtained through this device will be easily recomposed by collecting successively all scanned portions 8 in the same order as the one previously defined at the register time by the traveling [travelling] of substrate 2. Once recomposed, this image, or the included data, will then be used to define the possible shifts between the colors of the various prints during the operation of setting into register of the corresponding printing cylinders.

Paragraphs at page 6, line 17 to page 6, line 30:

Fig. 5 shows a reconstitution of the image of the concentric register marks of Fig. 3 from portions 8 of images scanned by device 1 in a different lighting mode than the one previously used. On this Fig., one easily detects the various lighting sequences constituting the selected lighting mode. The first sequence is performed by an alternation of a group 18 of three narrow contiguous areas 8a with a group 28 of three narrow contiguous areas 8b of another color. This succession of alternations is followed, in the central part of the register mark 32, by a second sequence of a succession of alternations of the areas 8a and 8b selected one by one, before entering again the first sequence issued from the alternations of groups 18 and 28. One can see, that, according to the shape and/or the size of a register mark, one [on] can advantageously vary the alternation lighting frequency, either increasing either reducing the lighting sequence of light sources 3, 4, or opening a diaphragm at the level of the optic 6 so that the surface of portions 8 of images changes proportionally.